

# PATENT SPECIFICATION

(11) 1 254 699

DRAWINGS ATTACHED



1 254 699

(21) Application No. 18765/68 (22) Filed 20 April 1968

(23) Complete Specification filed 18 April 1969

(45) Complete Specification published 24 Nov. 1971

(51) International Classification B 60 c 11/06 9/20

(52) Index at acceptance

B7C 3B7 3D3

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## (54) IMPROVEMENTS IN OR RELATING TO PNEUMATIC TYRES

- (71) We, DUNLOP HOLDINGS LIMITED, formerly The Dunlop Company Limited, a British Company of Dunlop House, Ryder Street, St. James's, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to pneumatic tyres. According to the present invention there is provided a pneumatic tyre having a tread pattern comprising at least one intermediate circumferentially continuous main-drainage groove of a width substantially greater than the width of circumferentially continuous main-drainage shoulder grooves provided one adjacent to each shoulder, circumferentially continuous ribs being provided defining the said grooves of a width substantially greater intermediate the shoulder grooves than the width of the ribs axially outwardly of the shoulder grooves, one at least of the wider ribs being subdivided by a circumferentially continuous auxiliary groove of a width for at least part of its depth substantially narrower than the said shoulder grooves.
- The tyre may have either a cross-ply or radial ply carcass and may be provided with a breaker assembly which may take any of the known forms e.g. two layers of textile or steel cords disposed at 20° to the mid-circumferential plane of the tyre, crossing one another, one layer with respect to the other.
- As regards groove width, the or each intermediate main-drainage groove may be about 4 to 6 per cent of the total tread width as measured between the axially outer extremities of the shoulder ribs; the relatively narrower main-drainage shoulder grooves each may be about 2 to 4 per cent of the said tread width; and the auxiliary groove or each of the auxiliary grooves may be about  $\frac{1}{4}$  to 1 per cent of the said tread width. In all instances the grooves and the tread width are measured in a truly axial direction i.e. 90° to the mid-circumferential plane. Where the groove or rib width is irregular, the average axial width is to be taken, it being borne in mind that, in accordance with the invention, the comparison between grooves gives a substantial decrease in width from the wider intermediate main-drainage groove(s) to the narrower main-drainage shoulder grooves to the auxiliary groove(s) the latter being the narrowest.
- The or each auxiliary groove is of a width such that the stability of the wider rib(s) is not substantially reduced compared with an uninterrupted wider rib of the same overall dimensions and so that the rate of wear shown by this wider rib is not substantially reduced by the auxiliary grooving.
- The or each auxiliary groove may be of less depth than the other circumferential grooves provided and may be of bulbous-base form when viewed in transverse cross-section.
- Any or all of the grooves may be, for example, of zig-zag shape viewed in plan or of a sinuous shape based on hexagonal angles, the grooves being skewed with respect to a radial plane of the tyre or not, some grooves being skewed so that the zig-zag or sinuous shape is generally inclined in one sense to said plane while other grooves have these shapes disposed in the opposite sense to said plane.
- A plurality of slots e.g. moulded by knife blades, may be provided in the ribs in known manner and the general direction of the slots, which may be of Z-form viewed in plan, may be inclined in the same sense with the skewing referred to in the preceding paragraph.
- Two embodiments of the invention will

now be described in more detail with particular reference to the accompanying drawings wherein:—

5 Figure 1 illustrates a fragmentary plan view of a tyre tread pattern according to a first and a second embodiment of the invention;

10 Figure 2 illustrates a fragmentary plan view of a tyre tread pattern according to a modification of the first and second embodiments of the invention;

15 In the first and second embodiments, the tyre tread according to each embodiment is applied to a textile carcass having four crossed plies of rayon cords disposed in the crown at substantially 33° to the mid-circumferential plane of the tyre.

20 In both embodiments the tread pattern employed illustrated in Figure 1 comprises 6 generally circumferentially extending grooves disposed symmetrically three on each side of the mid-circumferential plane of the tyre.

25 The axially inner pair and axially outer pair of grooves comprise the intermediate main-drainage grooves 2a and 2b and the main-drainage shoulder grooves 3a and 3b respectively.

30 A pair of auxiliary drainage grooves 4a and 4b are each disposed between an intermediate main-drainage groove 2a or 2b and a main-drainage shoulder groove 3a or 3b.

35 The figures which follow, in brackets, relate to the second of the two embodiments. The following description otherwise refers to the first embodiment.

40 The tyre is of size 7.35—14 (5.50—12), the tread portion thereof being provided with five generally circumferential zig-zag ribs 5a, 5b, 6a, 6b and 7, two narrow shoulder ribs 6a and 6b being provided and three wider intermediate ribs 5a, 5b and 7. The overall width of the tread 1 measured as earlier referred to is 5.30 inches (3.9 inches), the width of the narrow ribs 6a and 6b and wider ribs 5a and 5b being 0.7 inches (0.58) and 1.27 inches (0.86 inches) respectively. The ribs 5a and 5b each are centrally subdivided by a generally circumferential zig-zag shaped auxiliary groove 4a or 4b as earlier referred to.

45 Wider intermediate main-drainage grooves 2a and 2b are provided between the wider ribs 5a and 7 and between wider ribs 5b and 7 of width 0.22 of an inch (0.18), narrower main-drainage shoulder grooves 3a and 3b being provided between a shoulder rib 6a or 6b and an intermediate rib 5a or 5b of width 0.16 of an inch (0.15). The width of each of the auxiliary grooves 4a and 4b is 0.04 of an inch (0.03) for the greater part of its depth, the base (not shown) of each groove 4a and 4b being bulbous and 0.1 of an inch in diameter, 50 measured in transverse cross-section, while

the mouth of the grooves 4a and 4b is stepped to form an entry to the grooves 4a and 4b of width 0.12 of an inch.

70 The groove width measurements referred to are all measured as earlier referred to in this specification.

75 All of the ribs 5a, 5b, 6a, 6b and 7 are each provided with a plurality of zig-zag shaped slots 8, in respect of the intermediate ribs 5a or 5b the slots are disposed on each side of the auxiliary groove 4a or 4b.

80 In a modification of the first and second embodiments, a tread pattern 1 illustrated diagrammatically in Figure 2 is employed. The pair of intermediate main-drainage grooves 2a and 2b and the pair of main-drainage shoulder grooves 3a and 3b are of substantially linear form extending substantially truly circumferentially of the tyre, i.e. at 0° to the mid-circumferential plane. The pair of auxiliary drainage grooves 4a and 4b are of a sinuous form extending circumferentially continuously of the tyre. The widths of all of the grooves are the same as the grooves equivalent thereto described in the first and second embodiments of the invention. 90

95 It is an advantage that tyres in accordance with the present invention have improved drainage, obtained towards a centre of the tread pattern where drainage is most difficult to provide, and not only is this achieved but good tread wear characteristics are also achieved by virtue of the arrangement of wider and narrower ribs, particularly the stable wider ribs provided with auxiliary circumferential drainage which may or may not be supplemented by submerged drainage provisions, e.g. by the provision of a bulbous base. Furthermore, the stability 105 of the tyre tread i.e. whether or not the tread tears easily or whether it is too flexible and so fails to guide the vehicle at high speed or wears too rapidly, generally, particularly at high speeds, is improved over 110 tyres having conventional tread patterns by virtue of the disposition of the tread rubber in large ground-contacting areas in the form of wider ribs without detracting from the drainage properties of the tread pattern. 115

#### WHAT WE CLAIM IS:—

1. A pneumatic tyre having a tread pattern comprising at least one intermediate circumferentially continuous main-drainage groove of a width substantially greater than 120 the width of circumferentially continuous main-drainage shoulder grooves provided one adjacent to each shoulder, circumferentially continuous ribs being provided defining the said grooves of a width substantially greater 125 intermediate the shoulder grooves than the width of the ribs axially outwardly of the shoulder grooves, one at least of the wider ribs being subdivided by a circumferentially

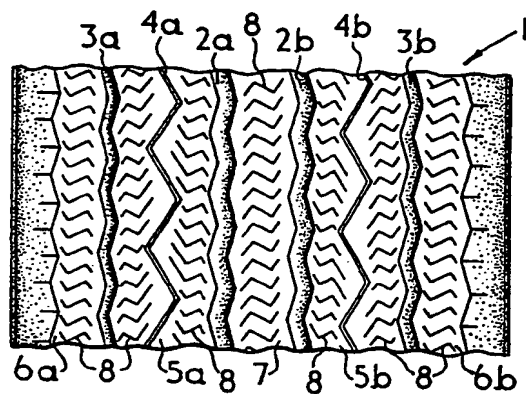


FIG. 1

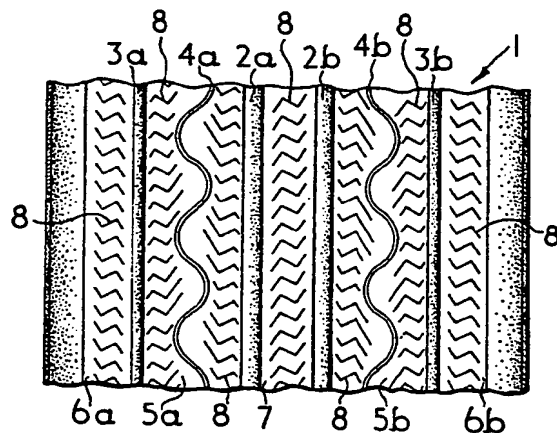


FIG. 2

continuous auxiliary groove of a width for at least part of its depth substantially narrower than the said shoulder grooves.

- 5 2. A pneumatic tyre according to claim 1 wherein the width of the or each intermediate main-drainage groove is between 4 to 6% of the total tread width as measured between the axially outer extremities of the shoulder ribs.
- 10 3. A pneumatic tyre according to either of claims 1 or 2 wherein the width of each main-drainage shoulder groove is between 2 to 4% of the total tread width as measured between the axially outer extremities of the shoulder ribs.
- 15 4. A pneumatic tyre according to any of the preceding claims wherein the width of the or each auxiliary groove is between  $\frac{1}{4}$  to 1% of the total tread width as measured between the axially outer extremities of the shoulder ribs.
- 20 5. A pneumatic tyre according to any of the preceding claims wherein each auxiliary groove is of bulbous base form when viewed in transverse cross-section.
- 25

6. A pneumatic tyre according to any of the preceding claims wherein each auxiliary groove is of a depth less than that of the other circumferential grooves provided.

7. A pneumatic tyre according to any of the preceding claims wherein two intermediate main-drainage grooves are provided. 30

8. A pneumatic tyre according to any of the preceding claims wherein two main-drainage shoulder grooves are provided. 35

9. A pneumatic tyre according to any of the preceding claims wherein two auxiliary grooves are provided.

10. A pneumatic tyre according to any of the preceding claims wherein a plurality of slots are provided in at least one of the ribs. 40

11. A pneumatic tyre constructed and arranged substantially as described herein with reference to the accompanying drawings. 45

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1971.  
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,  
from which copies may be obtained.